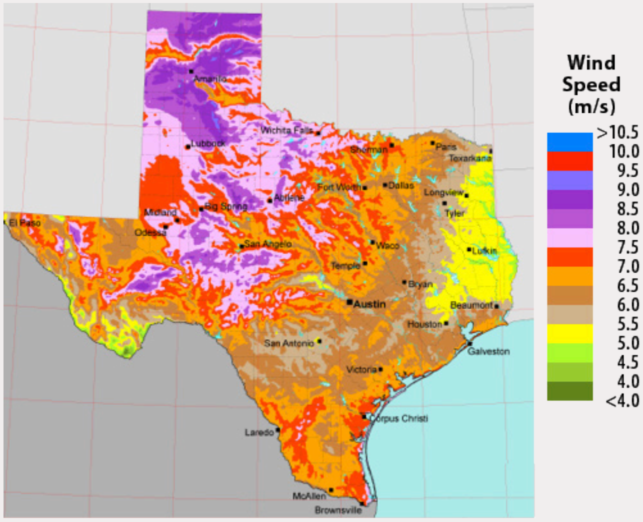
RENEWABLE ENERGY ZONES: DELIVERING CLEAN POWER TO MEET DEMAND



Wind map: Wind resource estimates developed by AWS Truepower, LLC for windNavigator Web: windnavigator.com awstruepower.com. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 14 WGS84.

The first Renewable Energy Zone (REZ) policy was in Texas. A REZ is an area targeted for transmission development to support renewable energy generation. The left-hand image shows annual average wind resources at 80m hub height. The right-hand map shows the five REZs identified through Texas' Competitive REZ (CREZ) process, and the new transmission infrastructure needed to access these zones. The transmission expansion planned under the CREZ process was completed in 2014, helping to stimulate the integration of over 14 GW of wind into Texas' grid [1,3].

The *Renewable Energy Zone (REZ)* concept has emerged as a transmission-planning tool to help scale up the penetration of solar, wind, and other resources on the power system.

A REZ is a geographic area characterized by several features that support cost-effective renewable energy (RE) development, including high-quality RE resources, suitable topography, and strong developer interest.

Developing a REZ allows power system planners to overcome the difference in timescales associated with developing transmission and RE generation. A utility-scale wind or solar plant takes 2-3 years or less to construct, while planning, permitting, and constructing new high-voltage transmission can take 10 years or more. This misalignment creates a circular dilemma: wind and solar developers face difficulties securing financing without access to transmission, but before approving new transmission, regulators typically need a guarantee that new lines will be used and that costs will be recoverable.

The REZ concept takes an alternative approach: planning new transmission to direct development to a region's best areas for RE generation. More importantly, this process can provide a legal and regulatory framework for planning transmission development and upgrades that enable cost-effective RE deployment.

IMPLEMENTING A REZ

The process for implementing a REZ begins with a review of the policy and regulatory environment for transmission planning—i.e., identifying barriers that prevent transmission development to the best RE resource areas, and assessing whether a REZ can help to overcome these barriers. Potential legal and regulatory considerations may include:

- Coordination among local and regional regulatory authorities
- Legal authority for land acquisition and/or right-of-way authorization
- Social and environmental concerns and other land-use restrictions
- Cost allocation of transmission investments

COMPETITIVE RENEWABLE ENERGY ZONES IN TEXAS

The process of implementing REZs can be tailored to encourage competition among project developers with the goal of developing high quality RE projects at least cost. One example of a competitive REZ framework was the Competitive Renewable Energy Zones (CREZs) process undertaken in Texas between 2005 and 2014. Prior to the implementation of CREZs, wind development overwhelmed existing transmission due to a lack of high voltage lines in the windiest parts of West Texas, leading to network congestion, curtailment of wind generation, and stymied investment. The CREZs informed the siting of new high voltage transmission lines that reduced network congestion and opened new, wind-rich areas for RE development. The resulting CREZ plan targeted high-capacity transmission development for zones containing three to four times more undeveloped wind potential than the new high-voltage lines could accommodate. This enhanced competition among RE developers and ultimately incentivized them to develop high-quality projects at least cost [2].

The costs of developing transmission to CREZs were folded into the electricity rate base that funded the rest of the transmission system.

STAKEHOLDER INPUT
(developers, consumers, land owners, utilities, environment groups, general public)

Conduct renewable energy resource assessment
↓
Screen resource areas for quality, development potential, and general social and environmental impacts
↓
Conduct a formalized input process for developers to indicate interest
↓
Conduct economic analyses of zones with high interest
↓
Designate REZs
↓
Develop and approve transmission plan to connect REZs to the grid
↓

Developing a REZ involves a combination of technical and regulatory actions and is informed by stakeholder engagement at all phases [3].

- Any other factors the regulatory authority believes may arise in a transmission siting decision (e.g., land tenure, eminent domain).

Once authorities decide to implement a REZ, the next step is to undertake an ***RE resource assessment*** to identify areas with high quality RE resources. Using geospatial analysis, this assessment ***screens resource areas for quality and development potential*** based on:

- RE resource quality (e.g., wind speed, solar irradiance)
- Topographic limitations for RE development (e.g., land cover, slope)
- Social and environmental constraints (e.g., protected areas).

The screening process can also involve identifying the social and environmental issues that are likely to narrow the selection of REZs. This approach may not preclude the need to conduct site-specific environmental or social impact assessments, but can be useful in streamlining these assessments so that they take less time.

The next step involves a ***formalized input process for developers to indicate interest*** in the areas identified through the initial screening. This step is critical for helping regulators prioritize potential REZs and validate the use of proposed transmission lines. Project developers can demonstrate their commitment to the proposed REZs via land acquisition, feasibility studies, and other financial commitments [3]. Areas with limited developer interest are given a low priority for transmission expansion.

After developers have provided their input and commitments, the regulator can ***commission economic analyses of zones with high interest*** to ensure their feasibility. Analyses such as grid integration studies (e.g., production cost modeling) determine how REZ scenarios impact power system operations. Additionally, cost-benefit assessments weigh production cost savings against the costs of new transmission.

These analyses inform the ***designation of REZs***. Once designated, the final step of implementing a REZ is to ***develop and approve transmission plan(s) to connect REZs*** to the grid.

Successful implementation of REZs relies on transparency and strong stakeholder engagement. Stakeholder buy-in at every stage of implementation builds support for revising laws, regulations, and plans. Frequent exchanges among regulatory and industry stakeholders help to anticipate and overcome institutional roadblocks, strengthen investor confidence, and reinforce public support. Additional stakeholders include non-governmental organizations engaged in environmental and land-use issues, public advocacy groups, and community organizations.

BENEFITS OF A SUCCESSFUL REZ

Developing a REZ can reduce reliability risks and improve the overall efficiency of system operations by opening access to diverse resources. For RE developers, transmission access is a necessary requirement for securing financing. Better transmission infrastructure reduces the risk of curtailment due to congestion, opens high capacity factor locations for new projects, and helps keep transmission lines loaded more efficiently. Overall, a proactive transmission planning process that successfully integrates REZs can significantly boost RE deployment, assisting energy planners in meeting their RE and climate change mitigation goals.

REFERENCES

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Greening the Grid provides technical assistance to energy system planners, regulators, and grid operators to overcome challenges associated with integrating variable renewable energy into the grid.

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